

VI. *Life-histories of Rhopalocera from the Australian region.* By GERVASE F. MATHEW, Staff-Paymaster, R.N., F.L.S., F.Z.S., &c.

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PLATE VI.

DURING a period of more than three years spent in cruising off the coasts of Australia and New Zealand, and amongst the islands of the Western Pacific, I devoted as much of my leisure time as I was able to in collecting Lepidoptera, and working out, to the best of my ability, the life-histories of such Rhopalocera as it was my good fortune to obtain the larvæ of. In doing this there were many obstacles to contend with, such as the constant change of locality, the shortness of our stay at the different places visited, and the difficulty of preserving fresh, for any length of time, the various food-plants for the sustenance of the larvæ.

For many years I have taken the liveliest interest in rearing Lepidoptera from the egg or larva, and noting the habits of the different species in a state of nature, and have often regretted, when perusing descriptive works on exotic butterflies, that so little has been written concerning their earlier stages, or so little said as to the general habits, localities, times of appearance, &c., of the species described. If, when practicable, such information were furnished, the books would be infinitely more valuable; and would, I feel convinced, tend to attract many more to the study of these charming creatures.

Melanitis leda, Linn.

In Australia, I have met with this species at Cooktown, Brisbane, and Thursday Island, and Mr. Masters informs me that he has taken it near Sydney. It probably occurs, in suitable places, in all tropical parts of Australia. In the Western Pacific I observed it at Fiji,

Samoa, the Friendly Islands, New Hebrides, New Caledonia, Solomon Islands, Duke of York Islands, New Britain, New Guinea, Pelew Islands, and the Caroline Islands. They vary considerably in size and markings from the different localities, but not sufficiently to form new species, except those from Ponapé, in the Caroline Islands, which are much smaller and much darker, and should perhaps be considered a distinct race.

My observations upon the habits and life-history of this butterfly were made chiefly in Fiji, where it was very abundant. It was principally to be found in shady spots in the forest, particularly by the sides of pathways where there was plenty of coarse grass, or by the edges of clearings where sugar had been planted. It has an uncertain, jerky, manner of flight, rising suddenly from under one's feet, flying for a short distance, and pitching abruptly, usually selecting a spot covered with dead leaves, where, with its wings closed over its back, it defies detection, as the colourings and markings of the underside harmonise so completely with its surroundings that it is very difficult to see, and it will not take flight again until one nearly treads upon it. It does not care to fly much during the day, except when the weather is dull, or when it is raining. I have seen them flying gaily in the midst of a tropical shower. Towards sunset they begin to get more lively, and may then be seen flitting across the pathways or sporting in forest glades; and long after sunset I have seen them flying wildly, and at a considerable elevation. They are decidedly crepuscular in their habits. It is rather a difficult butterfly to catch notwithstanding its apparently weak style of flight; but this may be accounted for by the fact that when disturbed it generally flies low among the herbage, and flits in and out between the bushes where it is not easy to follow it with one's net. It soon becomes worn, and not one half of those netted are fit for the cabinet. Indeed bred specimens very often look slightly worn although they may not have once flapped their wings. The least touch marks them, their wing-scales are so loose and delicate.

The eggs are deposited, five or six in a row, upon the terminal blades of sugar-cane, and upon various coarse grasses, *Cladium*, &c. It is difficult to understand what method is adopted by the parent butterfly in her selection

of the plant. There may be a dozen clumps of grass or sugar-cane growing close to each other, and to all intents and purposes exactly identical to the human eye, but larvæ will only be found perhaps on two of them, while the other ten will be entirely untouched. Upon one occasion, by the side of a path through the bush near Suva, I noticed seven clumps of, I think, wild sugar-cane growing about a yard apart. The first plant had been much eaten, and a very superficial glance disclosed a number of larvæ, chrysalids, and empty chrysalis cases. The next two plants were untouched, but the fourth was very much eaten; and, in addition to full grown larvæ and chrysalids, I counted upon the underside of one of the leaves near its tip, no less than twenty-six small larvæ and fourteen ova. The other three plants were intact. It is unaccountable why some of these plants should be selected and the others passed by when, as I have before remarked, to an ordinary observer there does not appear to be a bit of difference between them. Upon these same plants, which were so tasteful to *M. leda*, I also noticed larvæ of *Pamphila angustula*, Herr.-Schäff., but they did not occur upon the others.

Notwithstanding that so many young larvæ and ova occurred upon a single leaf, I should not on that account call the species gregarious; for the numbers were, without doubt, the offspring of several females, as the young larvæ were of different sizes. It should perhaps be called semi-gregarious, for I watched several females depositing ova, and found that they usually laid from five to seven, rarely more. As a rule it was not an uncommon thing to find seven or eight full-grown larvæ, or a like number of chrysalids, upon one plant. The larvæ are very easy to see, for they generally rest on the midrib on the underside of a leaf close to where they have last fed, and do not crawl down and hide themselves among the lower stems. They feed during the day and probably by night also. When full grown they descend to a lower part of the plant, and attach themselves to a pad of silk spun on the midrib of the underside of a leaf. The chrysalids are easily found by moving the stems aside. They do not appear to suffer from the attacks of ichneumons as all the larvæ and chrysalids I took produced perfect butterflies. But I have found fresh chrysalids, which have just assumed that state,

being devoured by small red ants, which appear to attack them when they are on the point of changing, and before the tissues have had time to harden.

The newly-laid egg, viewed through a lens, is perfectly globular, smooth, shining, and pale straw-yellow. In the course of twenty-four hours it turns to a pale yellowish green, and a few hours before it hatches the black head of the young larva becomes plainly visible.

The young larva is pale straw-yellow, with a few short, scattered brown hairs; head black and shining, with minute rudimentary spines upon the crown. The anal processes are scarcely visible. After its first change it becomes pale green with a darker dorsal stripe, pale yellowish green subdorsal and spiracular lines, and a few bristly hairs upon the head and each segment; head black and shining, with the spines upon the crown slightly more developed.

After the second change it is pale yellowish green, with dorsal, subdorsal, and spiracular lines brighter, and anal processes more conspicuous; crown, and sides of face black; spines on crown well developed, black; other portion of head covered with short, black, bristly hairs; just above the mouth an oval, and on each side of the face, a linear-shaped, green blotch.

After the third change the larva becomes altogether a brighter green, the head the same; spines on crown reddish brown, forming a dark line on each side of the face to the mouth; head, spines, and anal processes clothed with fine whitish hairs; hairs on body replaced by raised yellowish dots. The full-grown larva is elongate and subcylindrical with the second segment very narrow, and the anal segment produced into two processes terminating in sharp points; head very large and conspicuous, apple-green, and furnished with two carmine, rigid, spines on the crown, the carmine changing to black from the base of the spine to near the mouth on each side of the face, and bordered posteriorly by a narrow white stripe; whole of the upper surface bright apple-green, sometimes inclining to golden-green, irrorated with raised yellow dots, which, seen through a lens, emit short whitish hairs, and give the larva a somewhat roughened appearance; between the subdorsal stripe and spiracles a stripe of darker

green; dorsal line dark green; lateral skin-fold well developed; under surface, legs, and prolegs dull green.

When full-grown the larva remains perfectly motionless for twenty-four hours or more, gradually shrinking all the time, and then falls suspended head downwards, its anal claspers attached to a pad of silk which it had previously spun, and, in this position it remains for about another twenty-four hours, when it changes to a somewhat obtuse chrysalis of the usual satyrid form, with slightly bifid head. Its whole surface is beautiful grass-green, the veins of the wing-cases being slightly darker. The wing-sheaths, considering the ample wings of the butterfly, are comparatively small. The butterfly emerges in about ten days.

When not feeding the larva has a habit of crawling to the extremity of a leaf, where it rests with its head and first three or four segments hanging over and downwards, and, in this position, especially when viewed sideways, bears a strong resemblance to a praying mantis, and so, to a certain extent, may alarm any wandering ichneumon. A wise provision of Nature!

Epinephele abeona, Don. (Pl. VI., fig. 8).

This beautiful species is not uncommon near Sydney, but is local and only occurs in deep wooded gullies where different species of *Cladium*, upon which its larvæ subsist, grow in dense clumps by the margins of water-courses, or in low swampy ground between ranges of hills. It flies in an irregular uncertain manner around its food plant, or amongst brushwood in its vicinity. It is very conspicuous on the wing, and a pleasing object. Occasionally it settles upon a stone and expands its wings to the full glare of the sun. Once or twice I found them, towards dusk, roosting in little parties in miniature caves in the face of a sandstone cliff overlooking a swampy valley, and have seen them in similar situations during a shower.

I long suspected that the larvæ would be found feeding upon *Cladium*, as I noticed that the perfect insects were only to be met with where these plants grew, but it was not until October 27th, 1883, that I had the pleasure of discovering the larvæ.

I was out for a day's collecting in a small valley at

the back of Coogee Bay, about four or five miles from Sydney. A little rivulet runs through the centre of the valley, and here and there there were swampy places overgrown with coarse grass, rushes, ferns, and patches of *Cladium*, the hills on each side being clothed with the usual *Eucalypti*, *Banksia*, *Persoonia*, &c. I walked up the valley for nearly a mile when I came to a wall of rock, out of, and over which, the little stream dashed and splashed, and formed several cool and delicious-looking pools. The face of the rock was studded with patches of various kinds of lovely ferns, and a large and delicate species of *Pteris* (*P. tremula*) grew in masses at its base. Altogether it was a romantic spot, and well suited for a picnic party. Several specimens of *abeona* were disporting themselves here among the *Cladium*, which grew luxuriantly in large masses, and I noticed that some of the leaves had recently been nibbled, so I had a good hunt, and succeeded in finding some very small larvæ hiding away among the leaves at the base of the plant. These were evidently the larvæ of a *Satyrid*, and could be none other than those of *L. abeona*, which, indeed, they proved to be. I could discover no full-grown larvæ on this occasion, but a few days later I again visited this valley, and in another locality, a short distance from the waterfall, I was delighted to find four full-grown larvæ, and numbers of smaller ones. The latter I did not take, as I found the food-plants would not keep fresh; in fact the leaves shrivelled up before I got home, so the only chance I had of breeding the perfect insect was by taking the full-grown larvæ. Subsequently I dug up a few small plants and put them into pickle-bottles with wet sand, and then had no difficulty with my larvæ, for the plants kept nice and fresh for some weeks. A few days after this I succeeded in finding the beautiful emerald-green chrysalis, and during the remainder of my stay at Sydney I took numbers of both larvæ and chrysalids, and bred a good many butterflies.

This species appears to occur throughout the year. I have taken it in all its stages from August to May, but having spent no part of June or July at Sydney I cannot speak positively with regard to those two months.

The egg, which is perfectly globular and shining emerald-green, is laid upon the upper surface of the

leaves of the food-plant. The young larva has a very large head, out of all proportion to the rest of the body, shining black, very minutely punctured, and sparsely clothed with fine reddish brown hairs. Colour pale golden green inclining to rosy on two posterior segments; dorsal line faint, pulsating, and pale rosy; a few stiff reddish brown bristles upon the two posterior segments.

Full-grown larva cylindrical, tapering slightly towards each extremity; head subcordate, somewhat flattened and porrected, narrower than second segment; anal segment produced into two sharp conspicuous points. Ordinary colour a beautiful pea-green, but inclining, in some individuals, to a pale yellowish green; a dark pulsating dorsal line, bordered by a dull green stripe, next to which is a pale yellow-green line; an indistinct darker subdorsal line; whole larva transversely wrinkled, especially the anterior and posterior segments; anal points faintly tipped with purple; under surface, legs, and prolegs paler; mouth black, bordered with white; ocelli and spiracles very minute and black. A common variety of this larva has a beautiful, but somewhat interrupted, purple dorsal stripe.

When full-fed the larva attaches itself by its anal hooks to a pad of silk, spun on the underside of one of the lower leaves of its food-plant, or to a neighbouring twig, and changes to a short, stout, and somewhat obtuse chrysalis, with slightly bifid head. Colour beautiful emerald or grass-green; dorsal line darker; inner margin of wing-sheath bright yellow; spiracles minute, faint yellow.

The leaves of the *Cladium* possess exceedingly sharp edges so that it is almost impossible to search for these larvæ without returning home with one's hands and wrists considerably cut.

Acræa andromacha, Fabr. (Pl VI., figs. 14, 14 (a)).

This butterfly is local at Sydney, but uncertain in its appearance, at times being very abundant. It flies in a slow floating manner, and when in the net frequently feigns death. It is very tenacious of life, and requires a strong and prolonged squeeze to kill it. Towards sunset they assemble in numbers, and are fond of

roosting at the extremity of dead twigs, and, when in this position, can be easily captured between the finger and thumb.

On April 14th, 1883, I discovered the larvæ in a garden at Darling Point, Sydney, feeding upon a hedge of *Taxonia*. They were in the utmost profusion, and of all sizes, from the tiny individuals just hatched to the full-grown larvæ. In their earlier stages they are gregarious in their habits, but as they grow older they separate and wander about. Their chrysalids were hanging everywhere, and the butterflies were flying about in numbers.

On April 24th we left Sydney for a cruise. I then had a dozen larvæ still feeding, but in a few days all the food died and shrivelled up. I expected that the larvæ would die also, but to my astonishment they all crawled to the top of the breeding-cage and there fixed themselves to a pad of silk, and remained perfectly quiet, as if with the intention of hibernating. On May 13th, at Suva, Fiji, I placed three large *Noctuæ* larvæ in their box, but these did not disturb them in the least. In about three weeks I bred a beautiful moth from one of these larvæ, and as it was rather lively I dropped a few drops of chloroform into the box to stupefy it, and this had the effect of rousing the *Andromacha* larvæ, and most of them fell writhing to the bottom of the box. Next day several of them were dead. At the beginning of June, when we were among the Gilbert Islands, within a short distance of the line, the remaining four or five larvæ, which were very small half-starved looking creatures, began to move about, attached themselves in the usual manner, and in a few days changed to chrysalids. Between June 11th and 18th these produced very dwarfed butterflies. From the above it would seem that these larvæ have the power of abstaining from food for a lengthened period, which will account for the uncertain appearance of the perfect insects.

The full-grown larva is 30 to 35 mm. long, cylindrical, deep sienna-brown, and somewhat shining, with rows of long slender, subdorsal, spiracular, and subspiracular branched spines, the bases of which are seated upon slightly raised metallic, blue-black spots; dorsal and subdorsal stripe paler than general ground colour; head pale sienna-brown with black blotch on face, and a

V-shaped paler mark; legs and prolegs black; ventral area pale greenish yellow.

When full-fed the larva attaches itself to a pad of silk on the under side of a leaf, or stem of its food-plant, and hanging, head downwards, changes to a conspicuous and rather elongated black and white chrysalis, with a subdorsal and spiracular series of orange spots.

I have also taken this species at Brisbane, Fiji, New Hebrides, Thursday Island, and New Guinea.

Pyramcis Itca, Fabr., (Pl. VI., fig. 10).

This species was not uncommon in the neighbourhood of Sydney, but it was not abundant, for its food-plant, *Urtica incisa*, was very scarce. Indeed I only remember having seen one small plant growing under a wall in one of the suburbs, and this had several larvæ upon it. The nettles probably occurred in gardens, or waste places, not generally accessible to the public, or the larvæ may perhaps feed on something else as well. The butterfly was occasionally to be seen in the very heart of the city. It is fond of alighting upon walls, or upon trunks of trees, and invariably settles with its head downwards. It is a very rapid flier. The larvæ were very abundant at Hobart, Tasmania, in February, 1883, and I took a plentiful supply from a bed of nettles in a garden in the town, and bred a fine series of the perfect insect. I also met with the larvæ at Blackheath, on the Blue Mountains, in February, 1885, and I have received bred specimens from Norfolk Island, where it appears to be common. The eggs are laid singly, upon the terminal shoots of nettles (*Urtica incisa*), and although the larvæ are not, strictly speaking, gregarious, yet the same female appears to deposit a number of eggs upon the same plant. Directly the larvæ are hatched they proceed to spin the edge of a leaf together, and form a little tent in which to dwell, issuing forth from time to time to feed. They live in tents the whole course of their existence, constructing larger ones as they increase in size. But it sometimes happens that there are so many larvæ upon a single plant that they eat each other out of house and home, and may then be seen feeding quite exposed. When full grown they attach themselves by the anal hooks to a spray of their food-plant, or

wander to some adjacent wall, or paling, where they turn to a somewhat angulated chrysalis with blunt abdominal spines. The colour of the chrysalis varies, and depends upon the locality where they have effected their change. If against a wall they are reddish brown with a few abdominal silvery spots; but when attached to their food-plant they are beautiful objects, being like burnished gold, or opalescent golden green. They emerge in ten days or a fortnight.

The full-grown larva is from 30 to 32 mm. long, cylindrical, tapering towards each extremity; head cordate, notched on the crown, slightly hairy and much larger than the second segment; whole of the dorsal and subdorsal area smoky black, in some varieties dark hoary grey; dorsal stripe narrow and black; sometimes an interrupted white, or whitish yellow subdorsal stripe, bordered below with black; subspiracular area olive-green or olive-yellow; lateral skinfold well-developed, and pale yellow; spines small, branched, and blackish, or reddish brown, with the exception of those upon the lateral skinfold which spring from a reddish cushion, and are olive-yellow; ventral area smoky olive; legs black.

Junonia vellida, Fabr. (Pl. VI., fig. 11).

This is a common butterfly and appears to be pretty generally distributed. It occurs in open waste places, flies rapidly to and fro when disturbed, and alights abruptly upon a stone, or clear place, on the ground, keeping its wings expanded to the sun. The larvæ, near Sydney, feed upon *Plantago major* and *Plantago lanceolata*, and are not difficult to find. In the Botanical Gardens, I frequently noticed them upon *Antirrhinum*, and at the Friendly Islands they were feeding upon sweet potato; and at the Gilbert, Ellice, and Marshall Islands they were to be seen living quite exposed upon the broad, succulent, and glabrous leaves of a species of *Daphne* (?), and they probably feed upon a variety of other plants. I met with it at Sydney, Brisbane, Thursday Island, Hobart, New Guinea, Fiji, New Hebrides, New Caledonia, Samoa, Friendly Islands, Rotumah, Gilbert, Ellice, and Marshall Islands. The perfect insects vary considerably in different localities, the most marked variety occurring at Samoa.

The full-grown larva is from 37 to 40 mm. long, cylindrical, rather stout in proportion to its length, and tapers slightly towards the head; whole surface deep blackish brown, darker in some individuals than in others, and almost approaching a velvety black; a series of dorsal, subdorsal, spiracular, and subspiracular short, and rather blunt, finely-branched spines; a greyish lunular stripe upon each segment above the spiracles; a faint, and somewhat interrupted, whitish grey spiracular line; head black, cordate, notched on the crown, with a very short blunt spine on each side, and sparsely covered with fine black hairs; second segment, when head is stretched out for crawling, exhibits an orange-coloured collar; legs black; ventral and anal claspers tipped with tawny, and with tawny spots at the base.

The chrysalis, which is short and obese, is attached by its anal hooks to a pad of silk on the under side of a leaf, a stem, or an adjoining stone, and is dark umber-brown, speckled with greyish dots and blotches.

Doleschallia Herrichii, Butl. (Pl. VI., figs. 13, 13(a)).

This fine species was rather scarce at Havannah Harbour, Sandwich Island, and at Aneiteum, in the New Hebrides, from June to August, 1882. It is very strong on the wing, and fond of flying rapidly backwards and forwards in front of some high tree, and when it settles it generally does so far out of reach. It is ever ready to give chase to any passing butterfly, consequently nearly all those captured were more or less worn.

At Aneiteum, in August, I was fortunate to find its larvæ in some numbers, and succeeded in breeding a good series. Strange to say although such a high-flying butterfly, the larvæ were always found upon a low growing shrub, the name of which I am unacquainted with.

The eggs are laid in little batches of twenty or thirty all close together; they are quite round, and pale glossy yellow. The young larvæ are gregarious, but after changing their first or second skins they break up the family party and each larva starts forth on its own account. From observations made I am inclined to believe that they have the power of doing without food

for a considerable period, and wander to a great distance, for adult larvæ are found singly on bushes a long way apart.

When full-grown the larva feeds perfectly exposed upon its food-plant, and is then a conspicuous object. It is from 52 to 55 mm. long, cylindrical, and tapers slightly towards the head, which is cordate, and notched on the crown, with a stiff branched spine springing from each lobe; cheeks, lower part of face and mouth, deep metallic blue, almost black; the second and third segments much narrower than the head; whole of the dorsal and subdorsal area, as far as spiracular stripe, bluish or purplish, sometimes inclining to deep madder, and irrorated more or less with inconspicuous whitish dots; dorsal vessel interrupted, black; a subdorsal interrupted pale whitish stripe; an interrupted white spiracular stripe; ventral area, legs, and prolegs smoky greenish yellow; from fourth to tenth segments inclusive five, upon second and third four, upon twelfth six, and upon thirteenth four rigid, branched, blue-black spines, spring from a circular metallic blue-green base; from fifth to twelfth segments inclusive, interrupting the white subspiracular stripe, a conspicuous orange-red cushion seated on the lateral skinfold, and from which spring yellow branched spines tipped with black; spiracles minute and black.

When full-grown the larva spins a pad of silk to the underside of a leaf, attaches itself thereto, and becomes a smooth chrysalis of a reddish buff colour; a curved black line runs from the tail along the inner margin of the wing-cases to the eye, which makes it appear somewhat boat-shaped; spiracles, and some subspiracular dots black, with a few black dashes and striæ upon the wing-cases and abdomen.

These larvæ were taken between the 26th and 29th August at Aneiteum. They were very sluggish in their habits and flaccid to the touch, and were considerably infested by a dipterous parasite, and I lost several that were so attacked. The affected larvæ, when full-grown, ceased feeding, and remained stationary for two or three days, when they lost the power of holding on by their legs and anal claspers, and these two extremities falling, they were left suspended by their prolegs only, in a doubled-up position. Upon examination they were

found to contain some black fluid, and one fat maggot, which, in due course, produced a common-looking fly. Many of the larvæ turned to chrysalids during our passage to Sydney, but I lost a number of them from want of food. The first butterfly emerged at Sydney, on 16th September, and I bred altogether about two dozen fine specimens.

Hypolimnias bolina, Linn.

This is a very elegant butterfly, and its flight is most graceful. The males are fond of congregating in little parties of a dozen or more, in some shady nook, where there may happen to be any of the large-leaved trees or shrubs upon which they delight to sit, and, as one passes, they fly out in little flocks. It is then a pretty sight to watch them. One or two will go off rapidly as if in a great fright, but the remainder wheel backwards and forwards slowly in front of the spot from whence they started, and, if one keeps perfectly quiet, will settle again in the same place. They look very lovely as they thus float to and fro in a lazy, airy fashion, their dark blue-black velvety wings, with bright violet-blue centres, flashing a variety of brilliant rays in the bright sun, and making them appear like fairy gems. The females are more solitary in their habits, but are to be seen more constantly on the wing flying steadily along, on the look out for a suitable plant on which to deposit their eggs. They vary excessively, scarcely any two being alike, and some of the varieties are remarkably beautiful. The males, on the other hand, never show the least disposition to vary. The females seem to have regular beats, and appear to stick to the same spot for days, probably for the whole period of their existence. Often, while walking along a path through the forest, a female has flown out of a thick bush in front of me, and, day after day, as I passed the same spot, what I believe to have been the same butterfly has appeared. This was constantly occurring. Towards sunset the males assemble in large numbers, and "roost" together, and I have frequently beaten three or four dozen from the same bush.

The larvæ are not at all difficult to find, and, in some places, were most abundant. When feeding on *Sida rhombifolia* they have a habit of crawling high up

on their food-plant, towards evening, and are then conspicuous objects; and after heavy rain they wander about a good deal. The chrysalids were not uncommon, attached to twigs of the food-plant, or upon some neighbouring bush. In the hope of breeding some good varieties, I took, at different times and in different localities, a great number of larvæ, and succeeded in rearing a large series of butterflies, among them some fine and interesting varieties. The larvæ did not suffer much from the attacks of ichneumons, for only one out of the number I took was stung. They remained about three weeks in the chrysalis state.

The larvæ feed upon *Sida rhombifolia* and *Sida retusa*, and also upon a convolvulus which creeps over the ground in stony waste places; it also, I believe, feeds upon various species of *Portulacæ*, and probably upon other low plants.

The eggs are laid in irregular batches upon the undersides of the leaves, and, when quite fresh, are pale yellow, but they change to a deep leaden colour just before the larva emerges. Viewed through a lens the eggs are orange-shaped and finely ribbed. When quite young the larvæ are gregarious, but separate after the second moult. The young larva is dark greenish black; head black and shining, with no indications of the spines on the crown possessed by the adult larva: body spines represented by fine bristles, curved slightly forward; ventral area transparent yellowish green.

The full-grown larva is 52 to 55 mm. long, cylindrical, tawny black, with seven branched spines upon each segment, arranged in a ring; head cordate, reddish yellow, with a long branched spine springing from each side of the crown; second segment manifestly narrower than the head, and of the same colour; a somewhat interrupted sienna-brown spiracular stripe, most conspicuous upon the third and fourth segments; spines dark reddish brown, thickly branched with fine black bristles; legs, prolegs, and ventral claspers reddish brown; whole surface irrorated with very minute yellowish dots.

When ready to change the larva attaches itself to a pad of silk on the underside of a leaf or twig, and turns to a slightly angulated dark brown chrysalis, with abdominal spines, two blunt spines at base of wing-sheath,

and one or two on the thorax. I only noticed one variety of the larvæ; they were light reddish grey, clouded with ochreous-yellow, with the region from which the spines spring entirely ochreous-yellow, forming a series of rings; spines reddish yellow; spiracles black; a few black dots behind each subdorsal spine; subspiracular skinfold ochreous-yellow, and well developed, almost forming a lateral stripe; ventral area bluish grey; chrysalis from this variety pale reddish grey.

This butterfly is occasionally to be seen in the vicinity of Sydney, but I never met with it there myself. I have taken it at Brisbane, Cooktown, Claremont Islands, Thursday Island, Fiji, New Caledonia, Friendly Islands, New Hebrides, Rotumah Island, Solomon Islands, Gilbert Islands, Marshall Islands, Ellice Islands, Caroline Islands, Samoa, Pelew Islands, New Guinea, New Britain, and have received it from Norfolk Island.

Note.—On account of the extraordinary manner in which the females vary,—it being extremely difficult to obtain two exactly alike from the same brood of larvæ,—a number of new species have been described, among which I may mention *naresii*, *mosleyi*, *pallescens*, *pulchra*, and *montrouzieri* of Butler, and *otaheite*, Felder.

Lycæni heathi, Cox.

This species was local near Sydney, occurring only where its food-plant, *Westringia rosmarinifolia*, a shrub of from three to four feet high, and bearing clusters of white flowers, grew. This plant was chiefly confined to open ground near the sea,—though I found it sparingly in one or two localities a few miles inland,—so that the butterfly to a great extent is a maritime species. I had long noticed that it was only to be found in one or two places where this shrub grew, and had a suspicion that the larvæ fed on it, and beat it once or twice without discovering any. However, on February 28th, 1885, happening to be at one of its localities—a point jutting out into Botany Bay—I beat the bushes again into my net, and this time succeeded in obtaining a dozen full-grown larvæ of a *Lycæna*, which I thought would produce this species. There were plenty of small larvæ besides, but I did not take these. The full-grown larva

is of the usual *Lycæna* form, 13 to 15 mm. long, rather slender in proportion to its length; whole surface a beautiful pea- or apple-green, in some individuals the green upon the dorsal area being tinged with golden-yellow; viewed through a lens the whole body is irrorated with minute whitish dots, and a few short light-coloured bristles spring from the spiracular region, and above the head and anal flap; segmental divisions clearly defined; four short dark-coloured dorsal bristles upon each segment, springing from small tubercles; the tubercles on fourth, fifth, and ninth segments being often tinged with carmine, with a faint indication of that colour upon the others; in some of the larvæ these tubercles are very indistinct; a ridged sub-spiracular yellow line; spiracles very small and pale yellow; the twelfth and thirteenth segments somewhat flattened, and, from the dorsal surface of the latter the larva has the power of emitting two short whitish tentacles, the tips of which are furnished with a whorl of minute bristles; head pale amber colour, mouth darker, with a dusky round dot on each side of it. The tubercles on third and fourth segments are double. The half-grown larvæ are of a light greenish yellow, with a dark pulsating dorsal stripe, and very faint indications of dorsal tubercles. The larva feed upon the flowers and flower-buds, and also upon young leaves, eating holes from beneath in the centre of the leaf, but do not penetrate through the upper cuticle. When full-grown they attach themselves to the underside of a leaf, or to a stem. The chrysalis is from 10 to 11 mm. long and much resembles a chiton; the abdomen is considerably depressed and ridged laterally; the segmental divisions are clearly marked and ridged. The colour varies, those attached to the leaves being greenish yellow, or pinkish brown, while those attached to the stems are nearly black, and they are all more or less sprinkled with dark dots and pencilings; spiracles pale yellowish enclosed in a reddish ring.

The first butterfly appeared on our passage home at Batavia, on June 9th; the last in the English Channel, on August 26th, the day before we arrived at Plymouth.

Ialmenus evagoras, Don.

The larvæ of this beautiful butterfly live in society upon the "Wattle" (*Acacia*). On October 4th, 1884, I found, upon a small branch of "Wattle," at Paramatta, near Sydney, one pupa, a larva upon the point of changing, and a number of small larvæ, from tiny individuals just hatched to others nearly half-grown. This was evidently an early brood. At the same place, on February 9th, 1885, there were many of the perfect insects on the wing, and upon some young "Wattle" bushes, from two to three feet high, I noticed several clusters of pupæ-cases, one batch of fifteen which had not emerged, and numbers of larvæ of all sizes. The larvæ and living pupæ were attended by scores of small black ants, which continually ran backwards and forwards over them, and, as far as I could see, caused them no annoyance. The ants were attracted by some sticky saccharine matter which exuded from both larvæ and pupæ, and gave them a bright and varnished appearance. Upon placing my face close to these nests I fancied that I could detect a faint and rather sickly aromatic odour. Many of the butterflies were setting on the twigs among the larvæ and pupæ, and did not seem to be at all disturbed by the ants, although they flew away when I approached too near, but upon passing again in an hour's time they had renewed their old position. They are evidently rather sluggish in their habits, and do not appear to wander far from their food-plant, and from the above I should say that there are a succession of broods from spring to autumn, and that young bushes are selected in preference to older ones.

The larva a few days old is pale reddish brown, inclining to greenish upon the back, and with its whole surface covered with a few pale-coloured hairs; tubercles small, but plainly visible; head shining black.

The full-grown larva is 15 to 18 mm. long, sub-cylindrical, tapering to each extremity, and of a shining smoky greenish hue, in some individuals almost black; a pale yellowish green and somewhat interrupted stripe encloses the spiracles, and widens out considerably upon tenth and eleventh segments; a pair of blunt, double, fleshy, dorsal spines on second to tenth and on twelfth segments, those on third, fourth, and twelfth segments

much wider apart than the others, and those on fourth segment the longest; a short blunt spine just above the spiracles on all the segments except eleventh, twelfth, and thirteenth, those on seventh, eighth, ninth, and tenth being the most conspicuous; there is also a minute tubercle below each spiracle; an oblique narrow white line on each segment between the dorsal and spiracular spines; spiracles white in a black ring; a whitish spot at the base of most of the spines; under parts and claspers pale green; legs black; a few fine whitish bristles spring from the second segment and point over the head, and there are also scattered bristles along the spiracular region, chiefly above the claspers; all the spines are tipped with minute blunt bristles, which are, however, scarcely perceptible to the naked eye; segmental divisions clearly defined. The tubercles upon the twelfth segment have a small valvular opening at their summit, through which, when the larva crawls or is feeding, a telescopic organ surmounted by a whorl of fine bristles is constantly thrust.

Pupa attached to stem of food-plant; usually several close together; rather short and stumpy; shining reddish brown and black; wing-cases black, veins light sienna-brown and conspicuous; segmental divisions reddish, clearly defined; faint indications of tubercles on back; spiracles raised, pale reddish brown.

Elodina angulipennis, Luc.

This is rather a weak-flying butterfly. It was very numerous in the Botanical Gardens, Sydney, in April and May, 1884, and in March, 1885, frequenting the different *Capparis* bushes. I had not noticed it in 1882 or 1883. On May 12th, 1884, I watched a female depositing her eggs upon the tender leaves and terminal shoots of *C. nobilis*. Müell. The eggs are subconical and finely ribbed, and when freshly laid are pale straw-yellow, which changes in a day or two to a semi-transparent whitish hue spotted with pink. Unfortunately I was unable to carry on further observations regarding this species, as we left Sydney on May 17th for a cruise to the islands.

Pieris latilimbata, Butl. (Pl. VI., fig. 4).

This butterfly was very abundant in all its stages at Port Moresby, New Guinea, in November, 1884, and I also met with it on April 13th, 1885, at one of the Claremont Islands, off Cape Claremont, on the north-east coast of Queensland.

The larvæ feed upon a straggling thorny shrub bearing alternate suboval leaves, and possessing shining pubescent stems, which feel like velvet to the touch, and are of exactly the same colour as the larvæ. The larvæ live perfectly exposed, and when not feeding rest on the midrib of the leaf or upon an adjoining twig, and, upon being annoyed, throw their heads backwards and remain in that position for some time.

The full-grown larva is 28 mm. long, cylindrical, dull pea-green, and thickly irrorated with numerous transverse rows of small yellow raised dots, interspersed with fine short white hairs, especially upon the spiracular region; an indistinct and somewhat interrupted pale yellowish line just above the spiracles; head the same colour as the body, and covered with raised yellow dots and short scattered hairs; ventral area pale greenish grey.

The chrysalis is attached to a pad of silk on the under surface of a leaf, or to a stem. On several occasions I noticed it upon the upper side of a leaf. Its general colour is bright apple-green, and it is much angulated. The sheath of the haustellum forms a prominent beak, the wing-cases are produced into sharp spines, and the posterior segments narrow suddenly to a point. A large indented and somewhat triangular pale-coloured blotch extends across the abdomen; a raised yellow lateral ridge from base of wing-case to anal extremity; abdominal divisions clearly defined, pale yellowish green, with three or four small raised black dots on the apex. In some varieties the green is replaced by reddish green, and one or two larvæ which underwent their change in a chip-box became chrysalids of a uniform ashy-grey colour.

Pieris teutonia, Fabr. (Pl. VI., figs. 6 and 6 (a)).

This species, which seems to be local, was particularly abundant near the menagerie in the Botanical Gardens

at Sydney during May, 1882. It is a quick-flying insect. There were scarcely any flowers attractive to butterflies in bloom in the gardens at this time of the year, only a few passing Zinnias, and upon these *P. teutonia* occasionally settled. It was fond of resting upon shining evergreen leaves, where it would remain motionless for a considerable time, with extended wings, enjoying the full glare of the sun. It is of uncertain appearance, being abundant at some seasons and entirely absent or very rare at others. In the summer of 1882—83 it occurred in the greatest profusion, especially the second brood, which were in countless numbers; the topmost boughs of the caper-trees in the Botanical Gardens were stripped of their leaves, and the chrysalids were attached thickly to every twig, but I saw it nowhere else.

In 1884 I only noticed two butterflies (on April 18th), and three larvæ (on May 12th), and in 1885 there were none seen in the gardens, but I met with a single butterfly at Blackheath, on the Blue Mountains, on February 14th. It is strange that in 1884—85 the same caper-trees that were infested with *P. teutonia* in 1882—83 were frequented by numbers of *Elodina angulipennis*, Luc., a species I had not previously observed, and I noticed the females busily engaged depositing their eggs upon the caper-leaves. I may here remark that the two broods of *P. teutonia* are very different in appearance, the females of the summer brood being very deeply margined with black, particularly the hind wings, which in some cases are almost entirely black, and the orange-yellow markings beneath are much brighter.

This species is widely distributed. I have taken it at Fiji, New Hebrides, Friendly Islands, and New Guinea. It varies slightly in each locality, but not sufficiently to constitute a distinct species, or even a well-marked variety. Near Ne-afu, Vavua Island (Friendly group) it must have been in immense numbers in the summer of 1884, for one day, when I was out duck-shooting upon a lagoon, I noticed hundreds of caper-trees by the water's edge almost stripped of their leaves; and there were still a good many butterflies to be seen, although they were mostly passing. The native who was with me in the canoe could speak a little "pigeon" English, and he said that a month before they were in "*plenty, plenty,*" greatly emphasising the expression. I have

heard of immense flights of white butterflies having occasionally been seen in Queensland, proceeding at a considerable height from east to west, and should think it likely that they were this species.

On May 15th, 1882, I noticed a female fluttering about the topmost shoots of a small bush of *Capparis lasiantha*, R. Bth., and upon examination discovered hundreds of eggs, laid in batches of a dozen or more; they were of the usual *Pieris* type and bright straw-yellow. There were also numbers of larvæ of all sizes, but none of them appeared to be quite full-grown. I took a few of the largest. A day or two afterwards, while picking some fresh food for these larvæ, I found a number of empty chrysalids, two of which had the freshly-emerged butterflies sitting drying their wings alongside of them. I also picked two which had not come out, and which appeared a few days after in my cabin. When full-grown these larvæ appear to wander, for I noticed several empty chrysalids upon adjoining shrubs. The tree these larvæ were upon was rather a stunted unhealthy-looking one of its kind, and, although there were others close at hand in a flourishing condition, I could not detect that they had been in any way touched. This peculiarity I have noticed with other species. From January 4th to 20th, 1883, larvæ and chrysalids were in immense numbers upon three kinds of caper, *Capparis nobilis*, Muëll., *C. Mitcheli*, Lindl., and *C. lasiantha*, R. Benth., and I bred a large series of the butterflies.

The full-fed larva is cylindrical, and tapers at each extremity, especially the anal; head somewhat cordate, black, with a few minute yellow dots and scattered whitish hairs, and a white V-shaped mark on the face; whole of the upper surface, which is glaucous, dark olive-brown, thickly irrorated with very minute yellow dots; on the second segment, immediately behind the head, a series of three raised gamboge-yellow dots on each side of the dorsal vessel, and a single dot below, the whole forming a narrow ring; from each of these dots spring minute whitish hairs; on the third and fourth segments a row of six dots encircling the dorsal area; from the fifth to the twelfth segments inclusive these dots are arranged in a triangular pattern, and on the thirteenth segment they form a small patch, with two additional dots, which are rather conspicuous just

above the anal flap; dorsal line much darker; spiracular line indistinctly defined, and pale yellowish green; spiracles black, in a pale yellow ring, with a bright yellow dot just below each; between the spiracular line and base of prolegs and claspers there is a stripe of smoky green, from which grow a number of fine white hairs; ventral area yellowish green.

When full-grown the larva crawls to the back of a leaf or to a twig, spins a pad of silk in which to insert the anal hooks, girds itself with a silken thread, and in about twenty-four to thirty hours changes to a greenish grey and slightly angulated chrysalis. In some cases, however, the larva does not leave the leaf upon which it last fed, but becomes a chrysalis, quite exposed, upon its upper surface. A few hours before the exit of the butterfly the markings of the wings are plainly visible through the sheath.

Callidryas Gorgophone, Fabr. (Pl. VI., fig. 7).

This butterfly was not common at Sydney; I only noticed it once or twice, and took but one specimen. It is not easy to catch, for it usually flies at a headlong pace. One day, early in March, 1885, I observed a female flying about a *Cassia* bush in the Botanical Gardens, and upon examining it discovered a number of eggs, some small larvæ, and one chrysalis. This was the only bush of the kind in the gardens, though there were plenty of bushes of other species, *C. candoleana*, &c.; but I could find no traces of larvæ upon any of these. I took three or four dozen larvæ, and found them very easy to rear.

Full-grown larva 35 mm. long, cylindrical, beautiful apple- or grass-green, tinged below with yellow; whole body delicately ribbed and finely pilose; a conspicuous pale yellow spiracular stripe, above which, upon each segment, are two or three dark metallic-blue spots; viewed through a lens the body is thickly covered with minute brownish tubercles, which give the larva a slightly roughened appearance; head paler than rest of the body; under parts and ventral claspers pale yellowish green. The young larvæ a day or two old are yellowish green. They feed perfectly exposed upon the upper surface of the leaves, and when not feeding have a habit of keeping

their heads and anterior segments raised *Sphinx*-like: they grow very rapidly, and when full-fed attach themselves to a stem of their food-plant and change to a slightly angulated chrysalis, pale greenish yellow, with a conspicuous yellow spiracular stripe. The butterflies appeared in ten days or a fortnight, and invariably emerged just before dawn. Shortly before they were disclosed the wing-cases of the males became a beautiful yellow, and the spots could be plainly discerned at the margins of the wings; the females were much paler. The chrysalis of this species is not nearly so angulated, nor are the wing-cases or sheath of proboscis so produced as in many others of the genus. I have also taken this butterfly at Brisbane, Claremont Islands, and Thursday Island. None of my larvæ were ichneumoned.

Eurycus cressida, Fabr. (Pl. VI., fig. 12).

This interesting species was common at Thursday Island, and at Brisbane and Cooktown. At the latter place I noticed females depositing their eggs upon some low-growing creeping plant, apparently allied to *Aristolochia*, but failed to find any larvæ. Mr. Miskin, of Brisbane, kindly gave me a pupa, from which I bred a fine male. The butterfly flies straight and moderately high, and looks as if it was weak on the wing, though when it is frightened it can go at a rapid pace. In some places they assembled in large numbers round the flowers of *Eucalyptus*, and on these occasions were, of course, far out of reach.

ORNITHOPTERA.

I shall never forget the intense pleasure I experienced at seeing for the first time, in its native haunts, the magnificent *Ornithoptera durcilliana*. It was on 22nd November, 1882, at Meoko, one of the islands of the Duke of York group, situated between New Britain and New Ireland. We arrived and anchored in the little land-locked harbour, in front of the trader's house, early in the afternoon, and I at once went on shore. Meoko is a small island, not more than three or four miles in circumference, and densely wooded, some of the trees being of immense size and height, and the undergrowth composed of a varied and luxuriant tropical vegetation.

The island is traversed by a number of small paths which connect the different villages. These are of small size, being merely a collection of two or three badly-constructed huts. The natives are not a very enterprising race. The men go about perfectly naked, but the women wear a narrow kind of belt composed of strips of palm-leaves round their waists.

Upon landing I took one of the paths leading into the forest, and had not walked very far before I saw a large butterfly flying backwards and forwards at a great height between two trees. I could see that it was blue and black above, and golden green and spotted beneath, and at once knew what it was. I watched it for some time as it kept sailing to and fro, every now and then descending a little, and making me hope that it was coming within reach; then, mounting again rapidly, it continued its regular beat, until finally it settled among the branches, and I saw it no more. All this was very tantalising. Proceeding onwards, I came to a comparatively open spot, where several of these grand creatures were apparently taking their evening exercise before retiring to rest, the females, nearly twice the size of their mates, looking more like bats or birds than butterflies. It was now getting late, and they disappeared one after another amid the shelter of the high branches. Of course I was exceedingly vexed that none came within my reach, and hoped that I might be more successful the next day. However, I had a piece of good luck on my way back to the ship, for I suddenly saw, about twenty yards to the right of the path, a huge black spiny larva, suspended to the under side of a leaf of some forest-tree. Fortunately it was within easy reach, and I soon had leaf and larva in my hands, when I noticed that it had only recently attached itself, for it protruded its fleshy carmine-coloured tentacles, and otherwise exhibited signs of annoyance. I was overjoyed at my good fortune, for of course this could be no other than the larva of *durvilliana*.*

The next morning I landed directly after breakfast, and, having procured a bamboo about fourteen feet long,

* It changed to a chrysalis in a day or two, and on Christmas day, at Sydney, a splendid male emerged—a welcome Christmas present!

to which I fastened a net, proceeded to the spot where I had noticed the *Ornithoptera* the evening before, and here I remained for the greater part of the day. I also took a spare net with me, and some native boys to carry my boxes and make themselves generally useful. It was rather a dull day, and there were not many butterflies about, but we managed to secure six *urvilliana*,—three males and three females,—but none of them were quite perfect. The females occasionally fly low among the underwood, apparently engaged in depositing their eggs, and the males then often follow them. One of my boys succeeded in catching two at a single stroke of his net—a male and female. I ought to have obtained several others, but, although such large insects, they are not easy to secure, and one gets nervous and excited at the sight of such huge and brilliant creatures; moreover, my nets were far too small. When I got back to the ship I found that some natives had brought a pair of *urvilliana* on board, the male being much finer than any of my captures.

We remained at Meoko the whole of the following day, when I again paid a visit to the forest, and found several larvæ of *urvilliana*, of different sizes, feeding upon a large-leaved *Aristolochia*, which was creeping abundantly in some places over the low brushwood, but I took no more perfect insects.

On July 16th, 1883, we arrived at Matupi, a small island in Blanche Bay, New Britain, and about twenty miles from Meoko. Messrs. Hershheim & Co., German merchants, have a store there, and do a large trade with the natives in “copra,” the sun-dried cocoa-nut. I landed after lunch, and Captain Hershheim kindly placed a boat at my disposal, manned by about a dozen natives, in which I crossed to the mainland of New Britain, a distance of about two miles. The natives knew that I was in quest of butterflies, or “bembis,” as they called them, and professed to be able to take me to a spot where they said they were very plentiful. It was nearly three o'clock when we left Matupi, and about half-past when we landed upon the opposite side. At first we wandered through banana plantations, where butterflies were scarce, and I only captured a few *Danais sobrina*, Boisdu., *Melanitis Leda*, L., &c., and, being anxious to fall in with the great *Ornithoptera*,

I told the natives to lead me to the "bush," where they were more likely to occur: they replied, "bush too far," but this was sheer nonsense, as I could see it not more than half a mile off. They are a lazy lot these natives of New Britain. However, at last we managed to get clear of the bananas and sugar-cane, and reached the edge of the forest, where we found that we had to ascend a gentle hill, the slopes of which were cut up into numerous gullies. The soil was everywhere very light and friable, and in many places pierced with holes resembling foxes earths. I asked what they were caused by, and was told "pigeon with big egg"; and presently one of the boys thrust his arm into one of these holes, and, after feeling about for a short time, brought out a pale buff-coloured egg, as large as a hen's egg. These holes, the home of the megapode, were very numerous, so there were evidently plenty of birds, though I did not see one upon this occasion. Walking on we came to a tree covered with attractive flowers, and here butterflies were common, but confined to two species of *Danais*, *Euplœa*, and *Papilio polydorus*, Linn., *Diadema alimena*, Linn., and a few *Lycanidæ*; but the flowers were mostly high and out of reach, and not many captures were made. A little farther on there was another tree with shining dark green leaves, and small white tubular flowers possessing the most exquisite perfume. When plucked a thick white sap exuded from the broken stem, which made me think it was some kind of india-rubber tree. Flying among the topmost boughs, and unfortunately out of reach, were several huge *Ornithoptera*, and I noticed that the males were golden green and black above, and not blue and black like those taken at Meoko the previous year. It was now getting pretty late, and the large butterflies seemed to be feeding in a very leisurely manner, as if they had finished for the day, and several of them settled among the branches apparently for the night. I was in despair and just moving off to another tree, when I saw a male alight upon a twig about twenty feet from the ground, and close to the trunk of the tree, where he evidently meant to take up his quarters for the night. I waited for a few minutes to allow him to compose himself, and then sent one of the natives up the tree with my net. The butterfly kept quite still as he ascended, although

the branches were so much shaken that I expected every moment to see it fly away. However, the naked native crawled nearer and nearer, until he was well within reach, when he made a clever stroke and caught it, and handed the net down to me. To my chagrin it proved to be a very mutilated and ragged specimen, and quite unfit for anything, so it was allowed its liberty. A few minutes after this I had a wild run over some rugged and open ground, after a huge female, which went flapping along like an owl just in front of me. I came up with her, and was on the point of making a stroke when I put my foot into one of the megapodes' holes, and fell heavily among the coarse sedgy grass. This gave the butterfly such an advantage that I did not resume the chase, and, as it was now getting late, we returned to the boat.

We remained at Matupi the whole of the next day, the men being employed coaling ship; so I determined to have a long hunt for *Ornithoptera*. One of my mess-mates (T.), hearing my account of the megapodes' holes, took his gun and accompanied me. We left the ship at nine o'clock, and, having borrowed a boat from Captain Hershheim, with nine natives to pull and assist us, we soon reached the opposite side. We landed about three miles to the eastward of the point where we disembarked the day before, and within a short distance of a small active volcano, about three hundred feet high. As we neared the shore we noticed steam rising from the surface of the water, and many boiling springs could be seen bubbling up from the bottom, and the water near them was so hot we could scarcely bear our hands in it. Nothing grew within a hundred and fifty yards of the summit of the volcano, and its sides were deeply scored as if from lava action, and in many places jets of steam were issuing. Here and there there were large sulphur-yellow patches, and near its base, and not far from the shore, were numerous clumps of a peculiar bright sulphur-green grass, which were very conspicuous in contrast with the dark green forest foliage close at hand.

As soon as we landed we separated, my friend T. going one way with two or three natives to look for megapodes, while I, with the remaining natives, went in another direction in search of "bembis." We agreed to keep as near as possible, and to "cooey" occasionally

to each other, so that we might not get too far apart, and might meet for lunch. Our path at first took us through dense jungle, where no collecting could be done, but in about a quarter of an hour we reached a part of the forest where the undergrowth was less thick, and where a few butterflies, *Euplœæ* and *Hamadryas* sp.?, were taken. Pushing on we at length reached a ravine, through the centre of which it was evident a fierce torrent often ran. At the time of our visit it was almost dry, excepting a pool here and there, but the rest of the bed composed of smooth pebbles of various sizes. The banks were steep, the lower parts covered with a fringe of sedge and rough grass, above which were trees, bushes, and innumerable creepers. Here the magnificent metallic-blue and black-bordered *Papilio ulysses* was flying backwards and forwards in some numbers, but do what we could, neither myself nor the natives, whom I had provided with nets, succeeded in catching any. They flew very rapidly, and generally high out of reach, but occasionally one passed sufficiently near to afford, apparently, an easy shot, but somehow or another, just as I made a stroke at it, it swerved to one side with astonishing celerity. I was probably nervous at the sight of such a brilliant creature, and so missed it. Unfortunately there were no low-growing flowers to attract butterflies, but, on the other hand, there were two kinds of forest-trees from forty to sixty feet high, whose crowns were loaded with white blossom, and among which numberless butterflies could be seen disporting themselves, a sight which was most trying and tantalising.*

We wandered up the ravine for nearly a mile, catching Lepidoptera by the way, when suddenly, upon turning a corner, we saw, a short distance in front of us, that further progress was arrested by the face of a perpendicular cliff, some eighty feet high, and over which, during the rainy season, a magnificent waterfall must tumble. At the foot of the cliff, in the shade, were some pools of clear water, and, as it was now lunch-time, and

* I have been informed by Mr. Miskin, of Brisbane, that he once took a number of *P. ulysses* in the north of Queensland, flying before the flowers of a kind of pumpkin, which seemed to be very attractive to them.

this was a comparatively cool spot, I thought it would be a good place to rest. T. was not heard shooting, nor did he reply to my "cooeys"; indeed, I doubt if we could have heard each other for any distance on account of my being so far below the level of the surrounding country.

While I was at lunch a large and almost perfectly white *Euplœa* (*E. Browni*, Salv. Godm.) floated high over head, to and fro across the ravine, in an airy, graceful manner. Altogether this was a most romantic and beautiful spot; the lofty cliff behind, fringed at its summit by a variety of strange tropical trees; the almost perpendicular walls on each side, clothed to their base with thick shrubs and a multitude of creepers; the ravine stretching in front of us for some hundred yards, where a sharp turning suddenly shuts it in; its centre strewn with large blocks of stone brought down by the mountain torrents; with tiny green patches here and there, their margins bright with sedgy grass, lovely ferns, and unknown and beautiful-leaved plants. A few yards from where I sat, upon a dead tree, six naked savages reclined on the sandy shingle in the bed of the stream eating the ship's biscuit I had given them, smoking their pipes, and rapidly chattering their uncouth language.

After lunch and half an hour's rest I thought it was time to be off again, and, as there was no possibility of climbing up the cliff, we had to retrace our steps down the ravine. When we reached the spot where we entered it in the morning we passed on and continued our way towards the sea. A few *Euplœa Treitschkei*, Boisd., *E. pumila*, Butl., *Cyrestis fratercula*, Salv. Godm., and some *Lycenidæ* and *Hesperidæ* went to swell the contents of the collecting-box, but so far no *Ornithoptera* had been seen. In a short time we came to the end of the ravine, into some open grassy land, which ran down to the water's edge, the forest trending gently away to the right and left. We had barely entered this likely-looking locality when there was a sudden shout from the natives behind me, one or two who could speak a little broken English exclaiming "Here big one," "Here big fellow." I turned round at once and looked up into the trees, but could see nothing: the natives redoubled their shouts, and I kept turning round and round and looking

upwards until I got quite confused. At last I thought of looking lower, and then, just passing me, but a little out of reach, was a splendid large female *Ornithoptera* flapping lazily along. It must have flown quite close to me, and had I seen it sooner I should probably have had an easy shot at it. I followed as it flew by the edge of the forest just ahead of me, and presently it turned and went right across the open grassy space, keeping rather high. We continued in pursuit, the natives crying "burrigee, burridgee, burridgee," which meant "come down, come down"; but, it is needless to say, this had no effect on the butterfly, which kept along steadily until it reached one of the high trees with white-scented blossoms, and here it stopped and began fluttering from flower to flower. This tree was growing upon a slight eminence upon the bank of a small dry water-course. Upon the opposite side were forest-trees, and an undergrowth of various shrubs, over which the *Aristolochia*, from which I took the larva of *O. urvilliana* at Meoko last year, was climbing luxuriantly. We sat down near the tree and watched, and in a short time one, two, three glorious black and green male *Ornithoptera* joined the female, and commenced flying above her and following her from flower to flower. I now kept on the alert, for I knew it was likely that these attentions would make her fly low. In a short time one of the males left the female, and began feeding by himself, descending towards the lower branches as he did so. My net was fastened to the end of two joints of a bamboo-rod, making the handle eight feet long. I waited beneath the branch until at last the butterfly settled upon the very lowest flower. Still it was not quite near enough, but it was my only chance, and I thought by jumping up and striking at it I might possibly just reach it. It was an anxious moment. I took a big jump, made the stroke, and, to my intense delight, netted the black and golden-green beauty. After this we crossed to the opposite bank, and sat down and watched the others, which were still flying and feeding among the topmost branches. Constantly looking up was somewhat fatiguing, so I rested on my back for a few moments and closed my eyes. Presently there was a shout, and, sitting up, I saw a large female settle on a small bush about two feet from the ground the other

side of the water-course, while a beautiful male hovered just above her. I gave my net to one of the natives, as I thought I could not scramble across quick enough, and told him to catch the "big fellow." Over he went, and crept up stealthily within two yards of them, made a deliberate stroke at the female as she sat upon the twig, and, to my intense disgust, missed her clean. I felt so mortified and so angry at having sent the savage instead of going myself, but I thought he would be much quicker, and was afraid the butterflies would fly away. Just after this misfortune T., with his natives, arrived on the scene with eight megapodes and various other birds, and we sat down and made a kind of afternoon tea of our remaining sandwiches and Australian wine. While so engaged I happened to look round, and there were two *Ornithoptera*, male and female, flying quite low in the scrub just behind us. I jumped up, seized my net, and ran towards them, tumbling over a stump in the way, but picked myself up again not much the worse. As I drew near I moved more cautiously, and was pleased to see the female alight upon a large *Aristolochia* leaf, while the male remained hovering about a yard above her. Advancing as quietly as possible I got within reach, made a stroke, and had her safely. It would have been dangerous to have attempted to catch both at the same time. This female was a very large and fine example, and quite perfect. After killing her I pinned her to a twig in a conspicuous place on the outskirts of the scrub, hoping that she would attract some of the males, but, after waiting in the shade for more than half an hour, and no males appearing, I boxed her, and we proceeded through the bush towards our boat. We had not walked far when I saw a beautiful pair of our friends flying slowly towards us, the male "toying" after the female. I stood quite still, and they flew right at me, and I successfully netted the female. She was quite perfect. Soon after this we noticed another pair in the scrub, but they were in a difficult place to get at; so I sent a native after them, with instructions to capture the male if possible, for I noticed that the female was torn. He got quite near them, and was lucky enough to secure the male, which proved to be a fine fresh specimen. It was about four o'clock when this last *Ornithoptera* was taken; so it appears

that the afternoon is the best time of the day to obtain them. It was now getting late, and, as we were close to our boat, we embarked and returned to the ship, well pleased with our day's sport.

Although *Ornithoptera*, as a rule, fly high, the larvæ are generally found within easy reach. At Meoko, Duke of York Islands, I found full-grown and small larvæ of *O. durvilliana* within six feet of the ground, and empty pupæ-cases within two feet; and at Thursday Island, in Torres Straits, larvæ of *O. pronomus* were taken feeding upon trailing shoots of *Aristolochia* within a few inches of the ground (one of them was nearly trodden upon), while pupæ were taken from four to six feet from the ground.

Ornithoptera pronomus, Gray.

Length of full-grown larva from 58 to 64 mm., tapering towards each extremity; central segments much thickened; smoky black, some with a tinge of madder-purple; head black and shining, with a narrow white V-shaped mark on the face; upon the crown of the second segment a triangular-shaped shining black plate, just before which is the transverse nuchal aperture, from whence, when the larva is annoyed, a pair of short, thick, fleshy, carmine tentacles are protruded; a subdorsal row of rather long and finely-pointed spines, those on the posterior segments pointing backwards; tips and base black, intermediate parts carmine; the spine on the eighth segment is white at base with black tip, and pink in the middle, and with its base produced into a broad white oblique stripe pointing forwards, and terminating at the spiracular region; a row of black spines just below the spiracles; upon the third, fourth, and fifth segments an additional spine between the subdorsal and spiracular row; a short, black, blunt tubercle upon the second segment on each side of the face; a short black spine above each clasper and legs; claspers and legs shining black.

The chrysalis, which is of an amber-brown colour, is slightly angulated; a pair of blunt, subdorsal, black-tipped spines upon each side of the abdominal segments, and some small black spines upon the back of the thorax: a large and almost triangular-shaped orange-yellow blotch upon back of anterior abdominal segments;

wing-sheaths dark reddish brown, with the nervures well-marked.

Weight of larva $164\frac{1}{2}$ grains, of chrysalis $82\frac{1}{3}$ grains.

Ornithoptera urvilliana, Guér. (Pl. VI., fig. 1).

Length of full-grown larva from 55 to 60 mm.; comparatively short and obese; tapering towards each extremity; central segments much thickened; velvety black; head shining black; second segment crowned with a triangular black shining plate through a transverse slit, in which, when the larva is irritated, it protrudes two rather short, blunt, carmine, nuchal tentacles; a subdorsal row of eleven fleshy spines, black at their base and tips, and carmine between, except upon the eighth segment, where the base of the spine is pure white and runs into an oblique white stripe a little beyond the spiracular region; upon the third, fourth, and fifth segments there are intermediate spines of the same colour; a subspiracular row of black spines curved upwards; spiracles small, pale yellowish white; legs and prolegs black.

Chrysalis does not differ from that of preceding species.

Papilio erithonius, Cram.

This species appears to be rare in the neighbourhood of Sydney. I only saw it once, on September 27th, 1882, in the Botanical Gardens, settled on a verbena, and failed to catch it. On December 13th I met with it commonly in the Botanical Gardens at Brisbane, but it was then passing. In November and December, 1884, it was abundant at Port Moresby, New Guinea, and I found larvæ of all sizes feeding exposed upon a species of *Salvia*, and bred a fine series. It was not uncommon at Thursday Island, in the Torres Straits, at the end of April, 1885.

It is a rapid-flying butterfly, but is not difficult to catch when it is engaged fluttering among the *Salvia* bushes. It is also fond of settling by the margins of dirty puddles. The egg, which is perfectly globular and pale straw-colour, is deposited upon the upper surface of the leaves. The young larva is black, with a shining black head, and clothed with minute black spines. After

the first moult a few small orange blotches appear upon the back. The half-grown larva is very handsomely mottled with orange, yellow, and reddish brown and black. When it is full-grown it is 40 mm. long, with the third, fourth, and fifth segments rather thickened; ground colour sage-green, faintly tinged with yellow; a series of small pale yellow spots on each side of the dorsal line, and immediately below, and a little in front of them, a subdorsal row of spots of the same colour, but slightly larger; these spots on the fourth segment form a short transverse stripe; spiracles minute, pale yellow, enclosed in a black ring; just below the spiracles, from fifth to seventh segments, a small orange-red spot; lateral skinfold well-developed, creamy white, and forming a conspicuous stripe; anal flap, claspers, and ventral surface pale greenish white; head bluish green, with a treble series of light-coloured V-shaped markings on the face; a small black orange-tipped tubercle upon each side of the second segment just behind the head, and two of the same colour upon the thirteenth segment just above the anal flap; segmental divisions well-defined; nuchal tentacles rather short, thick, and salmon-coloured.

When full-grown the larva attaches itself to a stem of its food-plant, and changes to a rather slender and slightly angulated chrysalis of a pale greenish yellow colour.

At Port Moresby the butterfly frequented open waste places on hill-sides facing the sea. I never met with it in the forest.

Papilio indicatus, Butl. (Pl. VI., figs. 3, 3 (a), & 3 (b)).

I met with this rather commonly at Thursday Island, in Torres Straits, in April, 1885. At Port Moresby, in New Guinea, it was one of the most abundant species during our visit in November, 1884, and I succeeded in finding the larvæ and breeding a good series. One day while we were at anchor (we were nearly two miles from the landing place), a constant stream of butterflies passed the ship, flying across the harbour from south-east to north-west, the harbour being from three to four miles wide. Many thousands must have passed during the day, and three-fifths of them consisted of this species.

the others being different kinds of *Pieris*, *Euplaea*, *Libythea*, *Lycæna*, &c.

These butterflies were usually to be found in the forest, flying among the undergrowth. They were not difficult to catch, though perfect specimens were rarely obtained. I discovered the larvæ by watching a female which was slowly flitting from bush to bush, as if she was looking for the right one on which to deposit her eggs, and presently saw her settle upon a twig and thrust her abdomen beneath a leaf, and when she flew away I walked up and found the egg. The shrub was some species of *Citrus*. After this I had no difficulty in finding larvæ of all sizes.

The egg is deposited upon the upper or under surface of the leaf, the parent butterfly not being particular in this respect. It is perfectly globular, pale yellow when freshly laid, but changes to pinkish brown before the larva emerges. Young larva pale olive-green; anterior and posterior segments, and spines over the head, and over anal flap, white; a broad V-shaped mark on centre of back; a row of small, subdorsal, white spines; head shining black; anal flap dark olive-brown.

Full-grown larva 33 to 35 mm. long; rather slender; third, fourth, and fifth segments much thickened, with a blunt, fleshy spine on each side of the dorsal line, those on thirteenth segment much the largest and pointing backwards over anal flap; general colour beautiful mottled olive-green and reddish brown; an oblique, creamy white blotch commencing from, and enclosing, spiracle on fifth segment, and extending upwards to seventh segment, terminates just below dorsal line; an irregular-shaped blotch of the same colour on side of second, twelfth, and thirteenth segments; head pale greenish brown, with paler V-shaped mark over mouth; nuchal plate, and short blunt spines behind head, orange; nuchal tentacles deep carmine; spiracles very small, orange, in a black ring; lateral skinfold, and segmental divisions, well defined; a creamy white stripe below spiracles; ventral surface and claspers dull greenish, or greenish white; a raised bluish white dot on each side of the dorsal line upon fourth, fifth, and tenth segments; legs greenish.

These larvæ are extremely difficult to describe, scarcely any two of them being alike. Mottled olive-greens and

yellows and orange-browns and reds predominating. A common variety was of a uniform pale apple-green, mottled with lighter and darker shades, and with only a faint indication of the oblique stripe from back of head to crown of fifth segment, and stripe above spiracles clear greenish white, with the under surface and claspers slightly paler.

When full-grown the larva attaches itself in the usual manner to the stem of its food-plant, and changes to a dark, shining, apple-green chrysalis. Its back is rather humped, and head strongly bifid, a pale reddish brown stripe runs along costal edge of wing-case, and side of abdomen, to anal extremity; a row of dark green spots on each side of the ventral line, and another row of five spots on each side of these, nearer the median line. The butterflies emerged in about three weeks.

Papilio crectheus, Don.

This fine butterfly was tolerably plentiful at Sydney, especially in the neighbourhood of orange orchards. It is a very conspicuous species on the wing, and I shall not readily forget the first time I saw it careering down one of the streets of Paramatta, when I was on my way to visit the celebrated orange orchards, a few days after our arrival at Sydney, in May, 1882. It has an irregular style of flight, and, although so large, is anything but an easy butterfly to capture, and, when frightened, it goes off at a headlong pace. The sexes differ in a great degree in size, colour, and markings. The females were often to be observed fluttering among the lower branches of the orange trees, seeking for a suitable leaf upon which to deposit their ova. Different females acted differently in this respect; some flew up to the bush with a rush, and deposited their egg upon the first leaf that presented itself. These were the fresh inexperienced young females eager to lay their first eggs; the more sober and tattered ones expended a lot of time flitting from branch to branch before they could find a leaf to their liking, and then usually selected one growing from a sucker close to the main stem of the tree. While so employed they were quite fearless and easy to catch, and upon several occasions when I had no net with me I have taken them between my finger and thumb.

The egg is in most cases placed on the underside of the leaf, near its edge, though in several instances I noticed them upon the upper surface, or upon the terminal shoots. It is moderately large, and perfectly smooth and globular, and when freshly laid is pale straw colour. By the fourth day it has become of a darker hue, and a dusky shade begins to appear on one side, and this gradually deepens until by the ninth or tenth day it is almost black, the remaining portion of the egg assuming different shades of French gray. With a pocket-lens the young larva can be faintly seen within the shell. On the tenth day the larva emerges, and for a short time remains perfectly motionless as if to recover its strength after the exertion of gnawing its way to the outer world. When it has sufficiently rested, it turns round and deliberately devours the remains of its shell. It then wanders about for a little while, but does not often quit the leaf upon which it was born; but when it has satisfied itself with its examination it spins a little pad of silk on which to secure a firmer foot-hold; from this it proceeds to the edge of the leaf, where it nibbles its first repast, and this it continues to do as often as it is hungry, crawling backwards and forwards from its silken pad to the margin of the leaf.

When first hatched the young larva is about 3 mm. long; black, with the exception of the dorsal portions of the second, third, sixth, seventh, twelfth and thirteenth segments, which are white; head shining black. The whole larva seems to be covered with fine hairs, but, upon being viewed through a lens, these appear to be minute fleshy spines, though there are undoubtedly fine hairs interspersed amongst them. The third and fourth segments are considerably thickened.

The full-grown larva is 62 mm. long, somewhat cylindrical, and with the fourth and fifth segments considerably thickened. It is soft and flabby to the touch. Upper surface pale green, or greenish olive, mottled and streaked with darker shades of green; this ground colour, upon approaching the spiracular region, becomes of a golden, or golden-olive hue; a deep madder-brown stripe runs from the mouth below the spiracles to the fifth segment, when it turns obliquely upwards, and passes over the back, forming a broad conspicuous ring, the posterior part of which is of a deeper and more velvety shade

than the anterior ; this stripe is also dotted and streaked with white ; an oblique stripe of the same colour springs from the spiracular region of the eighth segment, and runs into the ninth segment, as far as the base of the subdorsal spine ; a triangular blotch of the same hue on the tenth segment ; these stripes, besides being dotted, are more more or less bordered with white ; there are some conspicuous black dots upon the lower part of the thirteenth segment, and a smoky V-shaped mark upon the anal flap ; there is a subdorsal row of blunt fleshy spines, orange, except upon the ninth, tenth, and eleventh segments, where they are black ; upon third, fourth, and fifth segments there are additional spines below the subdorsal row, and some minute fleshy points near the dorsal line ; head smoky black, with a white V-shaped mark upon the face ; legs smoky ; prolegs, subspiracular and ventral area, from seventh segment to anal claspers, glossy white.

When irritated these larvæ have the power of emitting two long carmine-coloured nuchal tentacles from a transverse, valve-like aperture, situated upon the crown of the second segment, just behind the head, and while the tentacles are exposed a disagreeable odour of rotten oranges is distinctly perceptible. The larvæ feed only by day, remaining perfectly quiescent throughout the night.

When within a couple of days of being full-grown it loses its power of exhibiting the carmine tentacles, but if annoyed, sways itself from side to side with a tremulous motion. Upon becoming full-grown it ceases to feed, remains in one position for several hours, and voids the contents of its intestinal canal, the "frass" becoming more and more liquified, until the larva finally passes a few drops of a clear, greenish, oil-like fluid. Shortly after this it commences to wander about searching for a suitable place to fix itself for its next change, and when it has chosen a spot it again remains quiet for an hour or two, and then begins to spin silk up and down the branch it has selected, taking care to lay it on thickest at the point which is to receive the terminal hooks of the chrysalis. The last thing it does is to spin the thread which girts the chrysalis, and this appears to be composed of a stronger material than that which is used for covering the branch with, although it may possibly be several threads united (as I know is the

case with the larger *Ornithoptera*). After this is accomplished it remains quiet, but jerks itself rapidly from side to side when any other larva approaches it, or it is otherwise annoyed, and its movements are often so violent that it is astonishing that the silken girdle does not break.

At seven o'clock one morning I observed a larva writhing and contorting itself in a remarkable manner. It was evidently on the point of changing, so I watched it carefully. The movements consisted of a series of whirling upward motions, and presently the head of the larva split transversely across the face, and the soft green tip of the chrysalis became visible. The rest of the change was effected with great rapidity, the whirling and pushing motion being continued without intermission, until the old larva skin had slipped down as far as the anal claspers, when the end of the chrysalis was suddenly withdrawn, and the old skin fell to the ground, the chrysalis meanwhile being supported by the silken girdle alone. The abdominal segments were then moved rapidly from side to side, the creature appearing to be searching for the silken pad into which to thrust the minute hooks at its extremity. When this was found the anterior part of the chrysalis was lowered as far as possible, and the whole curved upwards, bringing the tip almost at right angles to the orange stem. In this position the abdomen was quickly and vigorously whirled round and round as if the creature was endeavouring to screw the points into the silk, and in a few moments, this being accomplished, the chrysalis rested from its labours, only now and then giving a spasmodic jerk. The whole process of changing took seven minutes. At first the chrysalis looked soft and unshapely, but in an hour's time it had hardened, and assumed its ordinary form and angles. It was then 37 mm. long, of a beautiful green, the exact colour of the stem to which it was attached. Head strongly bifid; back arched; sheath of haustellum and base of wings prominent; there is a depression between base and anal angle of wing, which runs round the upper portion of the abdomen, and gives the chrysalis a constricted appearance; spiracular region strongly ridged; a silvery white and somewhat interrupted stripe runs from the base of the wings to the abdomen, and the lower part of the abdomen is suffused

with the same colour; upper portion of abdomen a beautiful golden greenish hue with two small red dots on each side. These chrysalids vary excessively, scarcely any two of them being alike, for they have the power of assuming the colour of the object to, or against, which they may be attached, and I have had them of all shades of green, brown, reddish brown, rosy, &c.

A larva hatched on October 29th changed to a chrysalis on November 17th, but as a rule they were generally a week longer in the larva state. Larvæ found from September to February produce imagos in a few weeks, but those taken in March, in most cases, remain in the chrysalis state until the following August or September. The larvæ do not appear to suffer from the attacks of ichneumons, or any other parasite, for no instance came under my notice. In all their stages the larvæ feed perfectly exposed, and the young ones bear a strong resemblance to a bird's droppings. This, of course, is more or less protective, but nevertheless they are kept well in check by a pretty little olive-green bird with white eyelids (*Zosterops cærulescens*, Lath.), numbers of which frequent the orange orchards and hunt among the trees in a very sprightly manner, having habits similar to those of our familiar chiffchaff. I have seen a tree with young larvæ upon every branch, and a few days after they had all disappeared. If it was not for this little bird I have no doubt this butterfly would cause an immense amount of mischief to the orange trees.

P. erectheus may be seen almost any day in the neighbourhood of Sydney between August and May, but during the two mid-winter months it is in the chrysalis state. I have taken it at Brisbane, and Cooktown, in the north of Queensland, in December, and at Thursday Island, in Torres Straits, in April; and it was not uncommon in the southern parts of New Guinea in November, 1884. All the butterflies I bred emerged between 5 and 9 a.m.

Papilio Anactus, Macl. (Pl. VI., fig. 2).

This species is generally distributed in the neighbourhood of Sydney, but I found it by no means common between 1882—84, and did not see more than half a dozen in the perfect state each year. It occurs in

orange-orchards, upon which tree the larvæ feed. It is a weak insect on the wing, and mimics *Acræa Andromacha* both in its general appearance and mode of flight. It appears from October to March, and, like *P. erectheus*, there is a succession of broods throughout the summer.

The eggs are deposited on the tender leaves of the orange, generally upon the under side near the edge. They are perfectly globular, flattened beneath, and pale straw-colour. The young larva is very similar to that of *P. erectheus*, but when full-grown it is quite different. It is then 37 to 39 mm. long, somewhat short and stout, cylindrical, and tapers slightly towards the head. The whole surface deep blue-black, irregularly spotted with minute white and bluish dots; a dorsal row of rather large heart-shaped yellow spots; a subdorsal row of large yellow spots, irregular in size and shape, with the exception of that on the fifth segment, which is round and very small; a subspiracular row of pale yellow linear-shaped spots from fifth to twelfth segments; legs smoky black, the foremost pair with an orange spot at their base; prolegs and ventral area brownish orange; head black, with a faint V-shaped mark on the face; a subdorsal row of short, blunt, black spines. When irritated this larva has the power of protruding a fleshy, bifid, orange-coloured tentacle from the nuchal aperture, upon the crown of the second segment just behind the head, at the same time emitting an unpleasant perfume of rotten oranges.

Two small larvæ, taken October 18th, 1882, attached themselves to the stem of their food-plant on the evening of November 4th, changed to chrysalids during the night of the 6th, and on the 16th of the same month, at 8 a.m., two beautiful butterflies emerged. Before attaching themselves these larvæ voided a quantity of frass and fluid-matter, and shrunk to about half their natural size, and I was afraid some disease had attacked them.

Papilio Lycaon, Westw.

This elegant butterfly is not uncommon in the neighbourhood of Sydney, and I have met with it at Newcastle, Cooktown, Thursday Island, and the south-eastern coast of New Guinea. It is more frequent some years than others. It appears from November to February.

It flies rapidly and generally high amongst the topmost boughs of trees, but descends occasionally to feed upon the nectar of various flowers, and is especially fond of those of the abundant "lantana."

Early in January, 1885, I noticed a female depositing her eggs upon leaves of the topmost branches of a cherrymoyer tree in the Botanical Gardens, and on February 21st, upon passing the same tree, I discovered a few small larvæ on the lower branches, and subsequently took larvæ and ova from other trees elsewhere.

The egg is usually deposited on the under side of a leaf, a favourite position being close to the edge near the stalk, though it is sometimes placed upon the upper surface. It is globular, and when fresh pale straw-colour, but in a few days it turns to deep orange, and shortly before the larva emerges it becomes a leaden hue. The larvæ in all their stages feed perfectly exposed upon the upper surface of the leaves.

Larva just hatched dark umber-brown; anal spines white; head brownish black, shining; anterior segments thickened. After first moult it becomes deep blackish brown; anterior segments much the darkest and considerably thickened, giving the larva a humped appearance; a pair of finely branched spines project over the head, and there is a pair upon the third, fourth, and thirteenth segments, and a pair of conspicuous white spines project over the anal flap; head black and shining. After second moult larva remains much the same. After third moult the whole of the upper surface becomes deep velvety black, inclining to madder-purple in some individuals, the segmental divisions, as the larva crawls, much paler; anal and ventral claspers, and a narrow stripe above them, creamy white; head sienna-brown, shining; anterior portions much thickened.

Full-grown larva 35 mm. long; varies in colour, some being dirty olive-brown, others greenish olive, and others deep madder-brown; dorsal area darker than general ground colour; segmental divisions pale smoky brown and clearly defined; head pale greenish olive; a white stripe below the spiracles from the fifth to the anal segment; third and fourth segments considerably thickened; two short, blunt, black spines springing from a pale greenish-orange collar, just behind the head, and situated on each side of the nuchal aperture; nuchal

tentacles short, curved, fleshy, and pale straw-yellow; on fourth segment a short, blunt, black, subdorsal spine, situated in a minute orange ring; anal segment produced, and with a pair of divergent spines at the extremity, the spines yellowish white above, but black beneath; there are a few short pale hairs on the head and under surface, especially at base of anal and ventral claspers; under surface and legs smoky; spiracles minute, whitish, in a darker ring. When full-fed the larva, having previously fastened the stalk of the leaf to the stem with several layers of silk, attaches itself to its upper surface and changes to a dark green chrysalis with a conspicuously-pointed thorax.

The young larvæ are eagerly devoured by the little White Eyes (*Zosterops cerulescens*, Lath.). I passed a cherrymoyer-tree one morning, and noticed numbers of small larvæ of *Lycæon* upon the lower leaves, and a few days after I went there for the purpose of taking some of them, but could not find one, these little birds having cleared them all off.

Pamphila phineus, Cram.

This skipper was common at Sydney in the Botanical Gardens, and in other gardens where palms were cultivated, but I did not meet with it in the bush. It flies very rapidly, and, after the manner of most Hesperids, is fond of taking up a position at the extremity of some exposed branch, from whence it darts forth and gives battle to every passing insect, returning after each encounter to the same spot, and in consequence of this pugnacious habit it is seldom to be taken in good condition. The females are rarely seen—indeed, I do not remember to have observed more than half a dozen: one I captured, another was noticed depositing its eggs, and the others were sitting, out of reach, upon the upper leaves of palms. There appears to be a succession of broods from spring to autumn, but during the winter months the larvæ, which are then small, hibernate between leaflets of palms, drawing the edges of the leaves securely together.

The egg is deposited on the under side of the leaf. It is perfectly globular, shining, and pale greenish yellow. As soon as the young larva is hatched it crawls to the

extremity of the leaflet, which generally rests upon or overlaps another, spins the edges of the two together, and so forms a little tent, from which it issues forth from time to time to feed, usually eating the leaflet from its tip towards the base. As it increases in size it forms a larger domicile, fastening the edges of the leaves together by little cables of united strands of white silk fixed to pads of silk placed about half an inch apart.

The full-grown larva is 40 mm. long, cylindrical, rather elongate and depressed, and tapering towards the head; head considerably larger than the second segment, flattened and porrected, and somewhat cordate, light pinkish grey, with black margins to face and a \vee -shaped mark in centre, and with a longitudinal black mark between mouth and base of \vee ; general colour of larva transparent slaty greenish grey, anterior and posterior segments rather paler; a darker pulsating dorsal vessel; upon the tenth segment there are two golden-yellow spots, lying just beneath the skin, and showing through on each side of the dorsal vessel (these spots are caused by some internal organs); anal segments sparsely clothed with fine white bristles; spiracles pale yellow; whole surface more or less finely and transversely wrinkled; lateral skinfold well-developed. Just before its final change it assumes a bluish green or leaden hue. When full-grown it spins the edges of the leaves more firmly together, constructs a light silken cocoon, and therein changes to a pale reddish-brown chrysalis, which is thickly powdered with a whitish-purple bloom. This powder exudes from beneath the ninth, tenth, and eleventh segments of the larva as it lies quiescent preparatory to its next change. The chrysalis, which is at first somewhat transparent and pale greenish yellow, is from 25 to 30 mm. long, cylindrical, and tapers towards anal extremity; thorax much broader; head and eyes prominent; thinly clad with short pale reddish-brown and slightly-curved bristles, those upon the head and thorax pointing forwards, while those upon the abdomen point backwards; just above and behind the eyes, upon the suture dividing the head from the thorax, there is a conspicuous oval reddish-brown tubercle; the sheath of the haustellum extends beyond the wing-cases as far as the base of the eleventh segment, and is faintly tinged with rosy. A day or two before the insect emerges the

chrysalis changes to a deep reddish brown, and just before disclosure the markings of the wings are plainly visible.

The larvæ feed on various kinds of palms, *Kentia Fosteriana* (a native of Lord Howe's Island), *Seaforthia elegans*, *Arica sapida*, *Phoenix reclinata*, different species of *Chamcerops*, &c., and they feed only at night. I also met with this butterfly in the Botanical Gardens, Brisbane, at Thursday Island, and the Duke of York Islands.

Pamphila angustula, H.-S.

This species was very common at Fiji. The males were far more numerous than the females. It occurred in paths through the forest, in sugar plantations, and wherever there was plenty of coarse grass or sedge, upon which, as well as upon sugar-cane, the larvæ feed.

The full-grown larva is from 28 to 30 mm. long, rather slender, cylindrical, and tapers towards each extremity; head smaller than the second segment, subcordate, somewhat porrected, dull greenish olive, and very minutely punctured; ocelli black; general colour pale yellowish green inclining to whitish; dorsal, subdorsal, and a series of lateral lines dull greenish blue; ventral area darker; spiracles very minute, yellowish; legs and claspers pale greenish; most of the segments, particularly the second, third, and fourth, more or less transversely wrinkled. It feeds between the united leaves of various coarse grasses and sugar-cane, and when full-grown fastens the blades more firmly together, sometimes closing both ends with a fine web; within this it spins a pad of silk for the reception of the anal hooks, encircles its anterior segments with a thread, and then undergoes its change.

The chrysalis is somewhat elongate and tapers slightly towards the anal extremity. The head has a conspicuously pointed and rather curved rostrum, the eyes are prominent, and the thoracic segments well-defined; general colour pale grass-green, with two whitish dorsal abdominal lines; tip of rostrum and anal point slightly rosy.

Netrocoryne repanda, Feld. (Pl. VI., fig. 5).

This butterfly occurs in several localities near Sydney, but does not appear to be very common. It flies rather

rapidly, and occasionally extends its wings rigidly and soars for a short distance, something after the fashion of *Neptis* or *Limenitis*, and when it alights, which it does very abruptly, it usually selects the under part of a leaf, where it rests with its wings widely expanded and appressed. On September 13th, 1884, I found several larvæ of this Hesperid in cocoons composed of a single leaf of a species of *Eugenia*. The leaf selected for the cocoon was doubled over upon itself, and the edges brought together until it formed a completely sheltered tent, having a round opening, evidently gnawed afterwards, facing the stalk, which was strongly fastened by silk to the branch. The leaves forming these cocoons had perished and turned to bright reddish brown, so were conspicuous objects among the green leaves of the tree. These larvæ were small, and so were probably still hibernating. On October 9th I met with more of them, and they were much larger than those found on September 13th, one or two appearing to be nearly full-grown, but I failed to rear any, as it was difficult to keep their food fresh. Moreover, the 'Espiègle' left Sydney on October 19th for New Guinea, so my observations for the time were necessarily brought to a conclusion. On December 13th we returned again, but I was unable to visit the tree until the 27th, when I found several cocoons containing empty chrysalids, and one with a full one, which from its appearance seemed to be on the point of emerging, and the next day produced a butterfly.

The full-grown larva is somewhat short and obese in comparison with known larvæ of other species of Australian *Hesperidæ*. Head ovate-cordate, dull smoky black, considerably larger than second and third segments; face divided by a suture down the middle, and with a depressed V-shaped mark above the mouth; cheeks somewhat swollen; second and third segments bright gamboge-yellow, the second segment being transversely streaked with green; a small black spot upon each side of the dorsal line, and a large black spot just above the spiracles on the third segment; dorsal area of fourth to eleventh segments smoky black, with a double grey dorsal line widening out upon seventh and eighth segments, and diminishing towards the eleventh; a broad pale grey subdorsal stripe from fourth to tenth segments, below which is a broad black stripe to eleventh

segment, where it runs up to the dorsal line and forms a transverse black band; below this there is a narrow stripe of gamboge-yellow, and in this the spiracles, which are small and black, are seated, and below this again there is a narrow pale whitish-grey stripe; twelfth and thirteenth segments gamboge-yellow, the twelfth with a narrow black dorsal line, with a black dot on each side; a black triangular spot just above the spiracles; on thirteenth segment a transverse longitudinal blotch upon the back, and two black dots above the spiracles; anal flap dull olive-green; ventral area and claspers greenish olive; legs the same colour, with smoky-black claws.

The chrysalis is enclosed in a cocoon of fine silk spun within the leaf-dwelling; it is short and rather obese, with the wing-sheaths strongly developed. Colour warm reddish brown; eyes darker and rather prominent; abdomen covered with a greyish powdery bloom. It is attached by the anal extremity, and is encircled by a silken girdle. The larvæ feed only by night.

Trapezites symmomus, Hübn.

This is one of the largest of the Australian Hesperids, and occurs in many localities in the neighbourhood of Sydney, is somewhat local, and nowhere very abundant. It appears to be found more frequently near the sea than inland, and some of its favourite habitats are the wooded headlands in the vicinity of Botany Bay. Its flight is extremely rapid, and it is difficult to catch, as it takes alarm at the least movement, although, like most of the family, it usually returns to the same spot after it has been disturbed, and can be secured by patient waiting.*

It was some time before I made the acquaintance of the larva of this butterfly, although I had long suspected that they fed upon *Cladium* (?), for they were only to be met with where it occurred, and the plants, which grow in dense clumps, were always more or less eaten. But

* I always box *Hesperidae*, for they flutter about so in the net that it is almost impossible to "nip" them in the ordinary manner, at any rate not without the risk of spoiling them. But they must be chloroformed and pinned at once, or they will batter themselves to pieces in the box in a very short time. I always carry a small bottle of chloroform for the purpose.

many a hunt for the larva was unavailing, and at last I almost came to the conclusion that they must feed upon something else, and that the eaten leaves were due to *Orthoptera*, which, in Australia, seem to devour anything green. However, one day in September, 1884, after a long and weary search, I discovered two old cocoons containing fragments of pupa-skins, but could find no larvæ. This was partial success, for it showed me I was on the right track, and stimulated me to renew my exertions on the occasion of my next visit to the locality on October 3rd. On this day I had another long hunt, and was just on the point of giving it up in despair when suddenly, to my great delight, I saw a large, plump, and full-grown larva ensconced low down among the stems of the plant, almost at the roots. After this I found a half-grown larva and several smaller ones, the latter being in little white silken cocoons spun up in the concave side of a leaf, about half-way down the stem. These, I fancy, were hybernating, although it seemed strange that some should be feeding while the others were quiescent. Others, too, must have been in the pupa state and ready to emerge, for I saw a fresh butterfly sitting upon a twig in the neighbourhood of its food-plant, but it darted off before I was able to secure it. There is a succession of broods, for I subsequently took many larvæ at different times of the year, and succeeded in rearing several of the perfect insects. In confinement they fed entirely by night, hiding by day low down among the stems of their food-plant. They grow very slowly.

On February 28th, 1885, I watched a female as she was engaged laying her eggs. She did not seem at all particular where she deposited them. The first was placed on the stem of the food-plant, about half-way down, the second upon a dead stem of the food-plant, the third upon a small twig near the root of the food-plant, the fourth upon a log of wood some distance off, the fifth upon a piece of dead fern, and the sixth upon a dried bent. She then flew away. The young larva in most of these cases would have to wander for some distance to find its food. The egg, which is large in comparison to the size of the butterfly, is perfectly smooth, globular, and pale greenish yellow.

The full-grown larva is 40 mm. long and very plump ;

head subquadrate, the posterior angles rounded off; a well-defined groove down the centre of the face, branching off at the middle, and forming a Λ -shaped mark above the mouth; outer edge of groove bordered by a broad ochreous-yellow line, which is again bordered by a shade composed of minute black dots; crown, back of head to junction with second segment and outer margin of face thickly mottled with black dots; general colour warm pinkish brown, thickly irrorated with minute raised dots and longitudinal markings of neutral tint; a narrow and somewhat interrupted dorsal line, on each side of which a moderately broad but somewhat indistinct stripe composed of minute black dots, being most perceptible on third to sixth segments; spiracles minute, black, and just below them a rather waved stripe of neutral tint; ventral surface, legs, and claspers smoky; the three posterior segments more or less tinged with dull olive-green; the segmental divisions, as the larva crawls, are conspicuously pink.

The young larvæ are similar in appearance to the full-grown ones, but the markings are somewhat less distinct, and the general colour is paler, and varies from warm pinkish brown to pinkish ochreous. When full-grown the larva constructs a loose open cocoon among the lower stems of its food-plant, and changes to a stoutish pupa from 25 to 28 mm. long, light reddish brown, thickly and minutely dotted with black, and covered with patches of powdery bloom; wing-cases paler; eyes prominent, dark reddish brown, and just behind and above them a small nuchal aperture, encircled by pale reddish brown; anal point well-developed, curved towards tip, dark brown.

Hesperilla picta, Leach. (Pl. VI, figs. 9 and 9 (a)).

This beautiful skipper occurs sparingly in the neighbourhood of Sydney, but is only to be found in the vicinity of its food-plant, *Cladium mariscus*, and consequently is somewhat local. I first met with it on November 3rd, 1883, while I was gathering some food for larvæ of *Epinephele abeona*, when I noticed some tips of the young shoots of *Cladium* spun together, and upon examining and opening them discovered the empty chrysalis of a Hesperid. I at once set to work and

looked for more, and, as there were only a few plants of *Cladium* growing in this locality, I was not long in doing so. The result of my search rewarded me with three more empty chrysalids and a full one, the latter evidently just on the point of hatching, as the wing-markings were plainly visible through the case, and the abdominal segments were much swollen. The larva which produced this chrysalis had spun the tips of the leaves together just in front of another chrysalis, completely imprisoning it, for when the lower one attempted to emerge it found its way blocked, and so perished miserably, and its remains were being devoured by some red ants, who had worked their way in through the lower end of the first cocoon. I fancy such a mistake as this does not often happen in nature. The next day the upper chrysalis produced a fine female, and, as I had not seen the species before, I was much pleased.

A few days after this I was again in the same locality for fresh food, but had no net with me, and so, as a matter of course, saw several *picta* flitting about among the *Cladium*. There were two males and a female. The former frequently darted off and regaled themselves on the flowers of a neighbouring lantana bush, but the latter, I observed, was assiduously fluttering among the lower stems of the *Cladium*, and, after watching her for a short time, I came to the conclusion that she was depositing eggs, and presently I saw her do so, and secured the egg. I subsequently obtained this butterfly in several other localities near Sydney, took many chrysalids and larvæ, and bred a nice series of them. There are a succession of broods from spring to autumn, and during the winter months the small larvæ hybernate low down among the stems of their food-plant in loose silken cocoons.

The egg is deposited on the under side of the leaf, generally near its tip. It is somewhat orange-shaped, flattened at the base, and with a minute depression at the apex, and is finely ribbed, the ribs widening from apex to base. At first it is clear straw-yellow, changing to greenish yellow on the second day. About the sixth day an apical purple blotch and a waved purple stripe appears round the middle of the egg, and the whole turns to a dull lead-colour shortly before the emergence of the larva. The newly-hatched larva is pale yellowish green,

with purple dorsal, subdorsal, and spiracular lines; second and third segments greener than the others; when the little larva crawls or stretches itself the divisions between the head and second segment are conspicuously reddish, and there is a small shining plate upon the second segment just behind the head; a few scattered hairs or fine bristles upon the two posterior segments; head black and shining.

The full-grown larva has the head considerably larger than the second and third segments, somewhat cordate in shape and clear sienna-red; the crown, a double line down the centre of the face, terminating in a small V-shaped mark, of a much darker red; general colour pale transparent olive or greenish yellow, the green or yellow being brighter in some individuals than in others; segmental divisions clearly defined and white; dorsal stripe dark green, pulsating, bordered by a faint white line; irregular internal deep green pulsating blotches on each side of dorsal stripe; subdorsal line white and conspicuous; twelfth and thirteenth segments suffused with a bright rosy tinge; a faint waved yellow line below the spiracles, which are of the same colour; ventral surface slightly paler.

When full-grown the larva spins two or three of the terminal shoots of the *Cladium* together, and forms a cocoon of fine white silk, within which it changes to a pale greenish-yellow chrysalis suffused with a bluish white bloom; head strongly bifid, bifid tips nearly black; eyes and segmental divisions pale reddish; at base of wing-case a dark reddish brown crescent-shaped spot. Shortly before the butterfly is disclosed the chrysalis becomes a deep reddish brown, and the spots on the wings can be plainly seen through the wing-cases. The larvæ feed by night, and during the day are to be found hiding away at the base of the leaves.

Hesperilla ornata, Leach.

The habits of this species are identical with those of *H. picta*, and the larvæ are very similar, but the perfect insects are quite different. It also appears to be more generally distributed, for I have taken it in many localities near Sydney where *H. picta* did not occur, and at Newcastle, about sixty miles to the north of Sydney;

and I have no doubt that it is to be found throughout New South Wales wherever *Cladium* grows.

The full-grown larva is elongate, cylindrical, and tapers slightly towards each extremity; general colour pale transparent yellowish green, inclining to rosy upon the two posterior segments; dorsal stripe dark green, pulsating; a paler yellowish green subdorsal stripe, bordered above and below by a darker shade of colour; head somewhat cordate, cinnamon-brown, with a central line down the face, and a dark V-shaped mark above the mouth. Feeds upon *Cladium mariscus*, &c. The chrysalis does not differ in any way from that of *Hesperilla picta*.

Note.—The *Hypolimnas*, whose life-history is given in this paper, appears to be a very different insect from the *H. bolina* of India, and I would therefore suggest that the Fabrician name *nerina* be adopted for it.

EXPLANATION OF PLATE VI.

- FIG. 1. Larva of *Ornithoptera urvilliana*, Guér.
 2. „ *Papilio anactus*, Macl.
 3. „ *P. indicatus*, Butl.; 3 (a), ditto, var.; 3 (b), pupa of ditto.
 4. Pupa of *Pieris latilimbata*, Butl.
 5. Larva of *Netrocoryne repanda*, Feld.
 6. „ *Pieris teutonia*, Fabr.; 6 (a), ditto.
 7. „ *Callidryas gorgophone*, Boisd.
 8. „ *Epinephcle abeona*, Don.
 9. „ *Hesperilla picta*, Leach; 9 (a), pupa of ditto.
 10. „ *Pyrameis itea*, Fabr.
 11. „ *Junonia vellida*, Fabr.
 12. Pupa of *Eurycus cressida*, Fabr.
 13. Larva of *Dolcschallia herriehii*, Butl.; 13 (a), pupa of ditto.
 14. „ *Acræa andromacha*, Fabr.; 14 (a), pupa of ditto.